

CODEX ALIMENTARIUS COMMISSION



Food and Agriculture
Organization of the
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World Health
Organization

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

AD HOC CODEX INTERGOVERNMENTAL TASK FORCE ON ANTIMICROBIAL RESISTANCE

Sixth Session

PROPOSED DRAFT REVISION OF THE CODE OF PRACTICE TO MINIMIZE AND CONTAIN FOODBORNE ANTIMICROBIAL RESISTANCE (CXC 61-2005)

(Revised by the TFAMR6)

See Annex I

**PROPOSED DRAFT REVISED CODE OF PRACTICE
TO MINIMIZE AND CONTAIN FOODBORNE ANTIMICROBIAL RESISTANCE
(CXC 61-2005)**

1. Introduction

1. Antimicrobial resistance (AMR) poses an important, complex, and priority, global public health challenge. ~~Within~~ Throughout the food chain, there is a need to address the risks associated with development, selection and dissemination of foodborne resistant microorganisms and resistance determinants. Responsible and prudent use of antimicrobial agents in all sectors following a One Health Approach and strategies for best management practices in plant/crop production animal production (terrestrial and aquatic), production of food of plant origin and food/feed processing, packaging, storage, transport, and wholesale and retail distribution should form a key part of multi-sectoral national action plans to address risks of foodborne ~~antimicrobial resistance~~ AMR.

2. This Code of Practice addresses the responsible and prudent use of antimicrobial agents by participants in the food chain, including, but not limited to, the role of ~~regulatory-competent~~ regulatory-competent authorities, the pharmaceutical industry, veterinarians, animal and plant/crop health professionals ~~and plant/crop advisors or consultants~~, and food producers and processors. It provides guidance on measures and practices at primary production, and during processing, storage, transport, wholesale and retail ~~and~~ distribution of food to prevent, minimize and contain foodborne antimicrobial resistance in the food supply. It also identifies knowledge gaps and provides guidance on communication strategies to consumers.

2bis. In keeping with the Codex mandate this Code of Practice ~~focuses-addresses on~~ antimicrobial use in the food chain. It is recognized that the use of antimicrobial agents in the food chain may result in exposure to antimicrobial resistant bacteria or their determinants in the food production environment. As part of a One Health strategy to minimize and contain antimicrobial resistance, only authorized products should be used and best practices in the food production sector should be followed to minimize the occurrence/persistence in the food production environment of antimicrobials and their metabolites from ~~anthropogenic sources~~ food production related activities, and to minimize the risks associated with the selection and dissemination of resistant microorganisms and resistance determinants in the food production environment.

3. This Code of Practice is an integral part of risk analysis focusing on risk management options and should be read in conjunction with other Codex texts including the *Guidelines on integrated monitoring and surveillance of foodborne antimicrobial resistance* and the *Guidelines for risk analysis of foodborne antimicrobial resistance* (CXG 77-2011). In addition, the *Code of hygienic practice for fresh fruits and vegetables* (CXC 53-2003) and the *Code of practice on good animal feeding* (CXC 54-2004) are particularly relevant for use of agricultural chemicals on plants/crops and animal feed, respectively.

3bis. This Code of Practice provides risk management advice, including the responsible and judicious-prudent use of antimicrobial agents that can be applied proportionate to risks identified through the risk analysis process described in the *Guidelines for risk analysis of foodborne antimicrobial resistance*. Risk managers are responsible for prioritizing and assessing foodborne AMR risks appropriate to the region and determining how best to reduce risk to introduce levels of protection appropriate for circumstances.

4. The *Principles and guidelines for the conduct of microbiological risk management* (CXG 63-2007) contains guidance for developing and implementing risk management measures. Setting priorities and identifying risk management measures should take into account the following:

- WHO guidance on integrated surveillance of antimicrobial resistance in foodborne bacteria, application of a One Health Approach;
- critically-[WHO list of critically important antimicrobials for human medicine, specifically the Annex with the complete list of antimicrobials for human use, categorized as critically important, highly important and important]
- Rrelevant chapters of the *OIE terrestrial and aquatic animal health codes* and the *List of antimicrobials of veterinary importance*, and
- National list of important antimicrobials for humans and animals where they exist, should also be referenced for setting priorities and identifying risk management measures.

5. Where available, national and local guidelines to prevent, minimize and contain foodborne ~~antimicrobial resistance~~ AMR should be taken into consideration. Best management practices and guidelines on the responsible and prudent use of antimicrobials developed by governmental and professional organizations should also be considered.

~~6. Recognizing there are mechanisms of co-resistance or co-selection in a range of antimicrobial agents, most~~

~~of the recommendations in this Code of Practice will focus on antibacterials, however some recommendations may also be applicable to antiviral, antiparasitic, antiprotozoal, and antifungal agents.~~

2. Scope

7. This Code of Practice provides risk management guidance to address the risk to human health ~~of the development associated with the presence in food¹ and the transmission through food~~ of antimicrobial resistant microorganisms or resistance determinants ~~through food~~. It provides risk-based guidance on relevant measures ~~and practices~~ along the food ~~and feed~~ chain to minimize and contain the development and spread of foodborne antimicrobial resistance, including guidance on the responsible and prudent use of antimicrobial agents in ~~plant/crop production and~~ animal production (terrestrial and aquatic) ~~and in the [production of food of plant origin] and feed~~ and references to other best management practices as appropriate. ~~It also provides risk based guidance on practices during production, processing, storage, transport, retail and distribution of food to minimize and contain the development and spread of foodborne antimicrobial resistance.~~ Its objectives are to minimize the ~~potential risk and~~ adverse impact on human health from foodborne AMR resulting from the use of antimicrobial agents in the food chain.

8. This document includes guidance for all interested parties involved in the authorization, manufacture, sale and supply, prescription and use of antimicrobial agents ~~along in~~ the food chain together with those involved in the handling, preparation, food processing, ~~storage, transport, wholesale and retail~~ distribution and consumption of food who have a role to play in ~~optimizing ensuring~~ the ~~responsible and prudent~~ use of antimicrobial agents and/or who have a role with limiting the development and spread of foodborne antimicrobial resistant microorganisms and resistance determinants.

68bis. Recognizing there are mechanisms of co-resistance or co-selection in a range of antimicrobial agents, most of the recommendations in this Code of Practice will focus on antibacterials, [however some recommendations may also be applicable to antiviral, antiparasitic, antiprotozoal, and antifungal agents.]

9. As there are existing Codex or internationally recognized guidelines, the following areas related to antimicrobial agents or AMR are outside the scope of this document: residues of antimicrobial agents in food; AMR marker genes in recombinant-DNA plants/crops² and recombinant DNA microorganisms^{3,4}; non-genetically modified microorganisms (for example, starter cultures) intentionally added to food with a technological purpose⁵; and certain food ingredients, which could potentially carry antimicrobial resistance determinants, such as probiotics⁶. In addition, AMR from non-food animals or non-food routes are also outside the scope of this document.

3. Definitions

Antibacterial: A substance that acts against bacteria.

~~**Antibiotic:** A naturally derived substance from a biological source that acts against microorganisms, specifically bacteria.~~

~~**Antibiotic resistance:** The ability of a microorganism, specifically bacteria, to multiply or persist in the presence of an increased level of an antibiotic relative to the susceptible counterpart of the same species.~~

Adverse health effect: An undesirable or unwanted outcome in humans. In this document, this refers to the human infections caused by AMR microorganisms and determinants in food or acquired from food of animal/crop origin as well as increased frequency of infections and treatment failures, loss of treatment options, and increased severity of infections manifested by prolonged duration of disease, increased hospitalization and mortality⁷.

¹ ~~As described in the Code of practice on good animal feeding (CXC 54-2004), food means food for man or animals.~~

² ~~The food safety assessment on the use of antimicrobial resistance marker genes in recombinant-DNA plants is addressed in the Guidelines for the conduct of food safety assessment of foods derived from recombinant-DNA plants (CXG 45-2003).~~

³ ~~The food safety assessment on the use of antimicrobial resistance marker genes in recombinant-DNA plants is addressed in the Guidelines for the conduct of food safety assessment of foods derived from recombinant-DNA plants (CXG 45-2003).~~

⁴ ~~The food safety assessment on the use of antimicrobial resistance marker genes in recombinant-DNA microorganisms is addressed in the Guideline for the conduct of food safety assessment of foods produced using recombinant-DNA microorganisms (CXG 46-2003).~~

⁵ The food safety assessment on the use of antimicrobial resistance marker genes in recombinant-DNA microorganisms is addressed in the *Guideline for the conduct of food safety assessment of foods produced using recombinant-DNA microorganisms* (CXG 46-2003).

⁶ The food safety assessment on the use of probiotics in foods is addressed in the Report of the *Joint FAO/WHO working group on drafting guidelines for the evaluation of probiotics in foods* (FAO/WHO, 2002).

⁷ *First Joint FAO/OIE/WHO expert workshop on non-human antimicrobial usage and antimicrobial resistance: scientific assessment* (December 2003).

Antimicrobial agent: Any substance of natural, semi-synthetic, or synthetic origin that at *in vivo* concentrations kills or inhibits the growth of microorganisms by interacting with a specific target. ~~The term antimicrobial is a collective for antiviral, antibacterial, antifungal, antiparasitic, and antiprotozoal agents.~~ [\[agreed\]](#)

Antimicrobial resistance (AMR): The ability of a microorganism to multiply or persist in the presence of an increased level of an antimicrobial agent relative to the susceptible counterpart of the same species. [\[agreed\]](#)

Antimicrobial resistance determinant: The genetic element(s) encoding for the ability of microorganisms to withstand the effects of an antimicrobial agent. They are located either chromosomally or extra-chromosomally and may be associated with mobile genetic elements such as plasmids, integrons or transposons, thereby enabling horizontal transmission from resistant to susceptible strains. [\[agreed\]](#)

Control of disease/metaphylaxis: Administration of antimicrobial agents to group of animals containing sick and healthy individuals (presumed to be infected), to minimize or resolve clinical signs and to prevent further spread of the disease. [\[agreed\]](#)

Co-resistance: The ability of a microorganism to multiply or persist in the presence of different classes of antimicrobial agents due to possession of various resistance mechanisms. [\[agreed\]](#)

Cross-resistance: The ability of a microorganism to multiply or persist in the presence of other members of a particular class of antimicrobial agents or across different classes due to a shared mechanism of resistance. [\[agreed\]](#)

Extra- or off-label use: The use of an antimicrobial agent that is not in accordance with the approved product labelling. [\[agreed\]](#)

Food chain: Production to consumption continuum including, primary production (food-producing animals, plants/crops), harvest/slaughter, packing, processing, storage, transport, and retail distribution to the point of consumption. [\[agreed\]](#)

Food-producing animals: Animals raised for the purpose of providing food to humans. [\[agreed\]](#)

Growth promotion: Administration of antimicrobial agents to only increase the rate of weight gain and/or the efficiency of feed utilization in animals. The term does not apply to the use of antimicrobials for the specific purpose of treating, controlling, or preventing infectious diseases. [\[agreed\]](#)

Marketing authorization: Process of reviewing and assessing a dossier to support a antimicrobial agent to determine whether to permit its marketing (also called licensing, registration, approval, etc.), finalized by granting of a document also called marketing authorization (equivalent: product license). [\[agreed\]](#)

Medically important antimicrobials: Antimicrobial agents important for therapeutic use in humans [taking into account those as](#) described in the *WHO list of critically important antimicrobials* [and categorized according to specified criteria as important, highly important, and critically important for human medicine](#) or [equivalent criteria established in](#) national lists, where available. It does not include ionophores or other antimicrobial agents not ~~used~~ [important](#) for human therapeutic use. [\[agreed?\]](#)

One Health Approach: A collaborative, multisectoral, and trans-disciplinary approach - working at the local, regional, national, and global levels - with the goal of achieving optimal health outcomes recognizing the interconnection between humans, animals, crops, and their shared environment. [\[agreed\]](#)

Pharmaceutical industry: Manufacturers and marketing authorization holders of antimicrobial agents. [\[agreed\]](#)

Pharmacovigilance: ~~to be further developed.~~ [The collection and analysis of data on how products perform in the field after authorization and any interventions to ensure that they continue to be safe and effective. These data can include information on adverse effects to humans, animals, plants or the environment; or lack of efficacy.](#) [\[agreed\]](#)

Plants/crops: ~~A cultivated plant that is grown as food or feed, especially a grain, fruit or vegetable, including all edible parts.~~ [A plant or crop that is cultivated or harvested as food or feed.](#) [\[agreed\]](#)

[\[Food of plant origin: All edible parts of plants/crops used as foods.\]](#)

[\[Plant/crop professional advisor and consultant / plant pathologist: A professionally trained person Plant/crop health professionals with knowledge and experience in plant/crop production health and protection practices.\]](#) [\[for further development in the EWG\]](#)

Prevention of disease/prophylaxis: Administration of antimicrobial agents to an individual or a group of animals at risk of acquiring a specific infection or in a specific situation where infectious disease is likely to occur if the antimicrobial agent is not administered. [\[agreed\]](#)

[\[Therapeutic use: Administration of antimicrobial agents for the treatment, control/metaphylaxis and prevention/prophylaxis of disease.\]](#) [\[not discussed\]](#)

Treatment of disease: Administration of antimicrobial agents to an individual or group of animals showing clinical signs

of infectious disease. [\[agreed\]](#)

4. General principles to minimize and contain antimicrobial resistance

Principle 1: A One Health Approach should be considered, wherever possible and applicable, when identifying, evaluating, selecting, and implementing foodborne AMR risk management options. [\[agreed\]](#)

Principle 2: Biosecurity, appropriate nutrition, vaccination, animal and plant/crop best management practices, and [other alternative tools to antimicrobial agents⁸](#) where appropriate, and that have been proven to be efficacious and safe, should be considered to reduce the need for use of antimicrobial agents. [\[agreed\]](#)

Principle 3: Science-based species or sector-specific responsible and prudent antimicrobial use guidelines should be developed, implemented, and reviewed on a regular basis to maintain their effectiveness in minimizing the risk of foodborne antimicrobial resistance. Such guidelines could be included as a part of national action plans or stakeholder-led plans on antimicrobial resistance with development and dissemination shared among countries and organizations. [\[agreed\]](#)

Principle 4: The *WHO list of critically important antimicrobials*, the *OIE list of antimicrobials of veterinary importance*, or national lists, where available, should be considered when setting priorities for risk assessment and risk management to minimize and contain antimicrobial resistance. The lists should be regularly reviewed and updated as necessary when supported by scientific findings as new scientific data emerges on resistance patterns. [\[agreed\]](#)

[Principle 5: Responsible and prudent ~~administration in food-producing animals~~ [use of antimicrobial agents](#) does not include the use for growth promotion of antimicrobial agents that are:

- ~~considered medically important;~~ or
- ~~able to cause cross- or co-resistance to other antimicrobial agents~~ [that are considered medical important.](#)

~~, or classes of antimicrobial agents, other than those referred to above should not be used for growth promotion that are considered medically important, in the absence of a risk analysis in accordance with CXG77. This risk analysis should:-~~

~~A. be undertaken by the appropriate national regulatory authority;~~

~~B. be based on adequate scientific evidence; and~~

~~include a publicly available summary.-]~~

[Principle 6: Medically important antimicrobial agents should only be used for therapeutic purposes (treatment, control/metaphylaxis or prevention/prophylaxis of disease); or in certain circumstances for research and conservation.] [\[for further development in the EWG\]](#)

[Principle 7: Medically important antimicrobial agents should only be used in well-defined circumstances for the prevention/prophylaxis of a specific disease risk and follow appropriate professional oversight, dose, and duration.] [\[for further development in the EWG\]](#)

Principle 8: Antimicrobial agents should be used as legally authorized and following all applicable label directions; except where specific legal exemptions apply. [\[agreed\]](#)

Principle 9: Foodborne AMR risk management measures should be implemented in a way that is proportionate to the risk and reviewed on a regular basis as described in the *Guidelines for risk analysis of foodborne antimicrobial resistance*. Risk managers should consider potential unintended consequences to humans, ~~and animal,~~ [and plant](#) health of recommended risk management measures. [\[agreed\]](#)

Principle 10: Monitoring and surveillance of the use of antimicrobial agents and the incidence or prevalence, and in particular trends, of foodborne antimicrobial resistant microorganisms and resistance determinants are among the critical factors to consider when developing risk management measures and evaluating the effectiveness of implemented risk management measures. Use of ~~medically important~~ antimicrobial agents in humans, ~~and food-producing animals,~~ [and plants/crops](#) and transmission of pathogens and resistance genes between humans, food-producing animals, and the environment are additional factors to consider, through the foodborne AMR risk analysis process described in the *Guidelines for risk analysis of foodborne antimicrobial resistance*. [\[agreed\]](#)

Principle 11: This document is designed to provide a framework, for the development of measures to mitigate the risk of foodborne AMR, that countries may implement, as part of their national strategy on AMR, in accordance with their capabilities, based on their national priorities and capacities, and within a reasonable period of time. A [stepwise progressive](#) approach may be utilized by some countries to properly implement applicable elements in this document proportionate to the foodborne AMR risk and should not be used inappropriately to generate barriers to trade. [\[move to](#)

⁸ ~~Could include ethnoveterinary and other approaches, e.g. herbal medicine, probiotics, competitive exclusion bacteriophages, immunomodulators, organic acids and teat sealants.-~~

the introduction]

[Principle 12: Medically important antimicrobials should be administered, prescribed, or applied only by, or under the direction of, veterinarians, plant/crop advisors or consultants or other suitably trained persons authorized in accordance with national legislation.] [for further development in the EWG]

~~**Principle 143:** Administration~~ The decision to use of antimicrobial agents should be based on sound clinical judgement, experience, and treatment efficacy. Where feasible and appropriate the results of bacterial cultures and antimicrobial susceptibility testing and integrated resistance surveillance and monitoring can ~~should also be considered.~~ [agreed]

~~**Principle 1314:** Administration~~ The choice of which antimicrobial agents to use should take into consideration relevant professional guidelines, where available, results of sampling and ~~susceptibility testing~~ of isolates from the production setting, where appropriate, and make adjustments to the antimicrobial agent selection based on clinical outcomes or when foodborne AMR risks become evident. [agreed]

~~**Principle 14:** Administration of antimicrobial agents should be based on sound clinical judgement, experience, and treatment efficacy. Where feasible and appropriate the results of bacterial cultures and antimicrobial susceptibility testing and integrated resistance surveillance and monitoring can also be considered.~~

~~**Principle 15:** The reduce, replace and rethink (RRR) strategy on the use of antimicrobial agents in animals and on plants/crops should be actively promoted within all sectors.~~ [agreed]

~~**Principle 1615:** On a continuous and~~ stepwise progressive implementation of risk management measures along the food chain to minimize the possible risks associated with foodborne AMR, priority should be given to the most relevant elements from a public health perspective. [agreed]

[5. Responsible and prudent use of antimicrobial agents

10. The *OIE terrestrial and aquatic animal health codes* contain detailed information with respect to the control of veterinary medicines for use in food-producing animals and aquaculture.

11. For more information on the data requirements for authorization of antimicrobial agents for food-producing animals see the International Cooperation on Harmonization of Technical Requirements for Registration of Veterinary Medicinal Products (VICH) guidelines.

Responsibilities of the regulatory authorities

12. The regulatory authorities, including the authority responsible for granting the marketing authorization for antimicrobials for use along the food chain, have a significant role in specifying the terms of the authorization and in providing appropriate information to the veterinarian and plant/crop advisors or consultants, or other suitably trained persons authorized in accordance with national legislation and producers through product labelling and/or by other means, in support of the responsible and prudent use of antimicrobial agents along the food chain.

13. It is the responsibility of regulatory authorities to develop up-to-date guidelines on data requirements for evaluation of antimicrobial agent applications. National governments in cooperation with animal, plant/crop, and public health professionals should adopt a One Health Approach to promote the responsible and prudent use of antimicrobial agents along the food chain as an element of a national strategy for the containment of antimicrobial resistance. Good animal production (terrestrial and aquatic) and best management practices for plant/crop production, vaccination and biosecurity policies and development of animal and plant/crop health programs at the farm level contribute to reduce the prevalence of animal and plant/crop disease requiring antimicrobial administration and can be incorporated into national strategies to complement activities in human health.

14. If dose ranges/application rates or different durations/re-application intervals of antimicrobial agent administration are indicated, the regulatory authorities should give guidance on the approved product labelling regarding the conditions that will minimize the development of foodborne AMR based on a risk assessment, while still maintaining efficacy and safety, when this information is available.

Quality control of antimicrobial agents

15. Regulatory authorities should ensure that quality controls are carried out in accordance with international guidance and in compliance with the provisions of good manufacturing practices.

Assessment of efficacy

16. Assessment of efficacy is important to assure adequate response to the administration of antimicrobial agents. As part of the marketing authorization process, it should include the efficacy with optimal dosages and durations, supported by clinical trials, microbiological data (including antimicrobial susceptibility testing) and pharmacokinetic data. It may also include assessment of through proper veterinary care, program evaluation

and good pharmacovigilance practices.

Assessment of the potential antimicrobial agents to select for resistant microorganisms

17. The regulatory authority should assess the potential of medically important antimicrobial agents to select for resistant microorganisms taking into account *Guidelines for risk analysis of foodborne antimicrobial resistance*, the *WHO list of critically important antimicrobials*, the *OIE list of antimicrobials of veterinary importance*, or national lists, where available.

Assessment of environmental impact

18. Regulatory authorities should assess the impact of proposed antimicrobial agent-use on the environment in accordance with national guidelines or recognized international guidelines.

19. Regulatory authorities should consider the environmental aspects on foodborne AMR e.g. pollution from pharmaceutical manufacture, impacts of reusing waste water for irrigation, and using manure and/or municipal wastes for soil fertilization. When foodborne AMR risk is determined through the *Guidelines for risk analysis of foodborne antimicrobial resistance* the need for monitoring and proportionate risk management measures can be considered.

Establishment of a summary of product characteristics for each antimicrobial agent

20. Regulatory authorities should establish a Summary of Product Characteristics or similar document. The information in the summary of product characteristics can be utilized in labelling and as a package insert.

Surveillance and monitoring programmes

21. Regulatory authorities should establish systems for the surveillance and monitoring of antimicrobial resistance and antimicrobial use following the *Guidelines on integrated monitoring and surveillance of foodborne antimicrobial resistance*, taking into consideration relevant sections of *Guidelines for risk analysis of foodborne antimicrobial resistance*; *WHO guidelines on integrated surveillance of antimicrobial resistance in foodborne bacteria, application of a One Health Approach*; and *OIE terrestrial animal health code Chapter 6.7 Harmonization of national antimicrobial resistance surveillance and monitoring programmes* and *Chapter 6.8 Monitoring of the quantities and usage patterns of antimicrobial agents used in food-producing animals*, the *OIE aquatic animal health code Chapter 6.3 Monitoring of the quantities and usage patterns of antimicrobial agents used in aquatic animals* and *Chapter 6.4 Development and harmonization of national antimicrobial resistance surveillance and monitoring programmes for aquatic animals* and section 8 of chapter 6.9.3 on post-marketing antimicrobial surveillance.

22. The surveillance and monitoring of antimicrobial resistant bacteria in different production sectors and in different food products and at different stages of the food chain, should be undertaken to understand the development and dissemination of antimicrobial resistance, provide relevant risk assessment data, and to assess the effectiveness of interventions. Surveillance and monitoring programmes may entail specific or continuous data collection, analysis and reporting that quantitatively monitors temporal trends in the occurrence and/or prevalence and distribution of resistance to antimicrobial agents; and also allow the identification of emerging or specific patterns of resistance. Surveillance and monitoring programmes should be prioritized based on the risk to public health, national priorities, should be practical and feasible, and may be implemented following a stepwise approach.

22bis. Regulatory authorities should have in place a pharmacovigilance program for the monitoring and reporting of adverse reactions to veterinary antimicrobial drugs, including lack of the expected efficacy related to microbial resistance. The information collected through the pharmacovigilance program should form part of the comprehensive strategy to minimize microbial resistance.

22ter. In cases, where the assessment of data collected from pharmacovigilance and from other post-authorization surveillance including, if available, targeted surveillance of antimicrobial resistance, suggests that the conditions of use of the given veterinary antimicrobial drug should be reviewed, regulatory authorities shall endeavor to achieve this re-evaluation.

Distribution of antimicrobial agents

23. Regulatory authorities, to the extent possible, should make sure antimicrobial agents are distributed through appropriate distribution systems in accordance with national legislation and medically important antimicrobials are distributed to appropriately credentialed/registered veterinarians, plant/crop advisors or consultants, or other suitably trained persons authorized in accordance with national legislation.

24. Distribution should be regularly controlled by the regulatory authorities, and monitoring of sales of antimicrobial agents could be undertaken and information could be analyzed with appropriate context to identify areas of concern and potential follow up.

Control of advertising

25. Regulatory authorities should assure that advertising of antimicrobial agents is done in accordance with national legislation.

26. Advertising of antimicrobial agents should be done in a manner consistent with prudent use guidelines and any other specific regulatory recommendations for the product.

27. All advertising of medically important antimicrobial agents should be controlled by the relevant authorities.

- The authorities should ensure that advertising of antimicrobial agents:
 - complies with the marketing authorization granted, in particular with the content of the summary of product characteristics; and
 - complies with each country's national legislation.

Training of users of antimicrobial agents

28. Training should involve all the relevant professional organizations, regulatory authorities, pharmaceutical industry, schools, research institutes, professional associations, trade associations and other approved users such as farmers and producers and should focus on:

- information on disease prevention and management strategies to reduce the need to use antimicrobial agents;
- relevant information to enable the veterinarian and plant/crop advisors or consultants to use or prescribe antimicrobial agents responsibly and prudently;
- training in new methodologies for molecular analysis of resistance;
- the ability of antimicrobial agents to select for resistant microorganisms that may contribute to animal, plant/crop, or human health problems; and
- the need to observe responsible and prudent use recommendations and using antimicrobial agents in production settings in agreement with the provisions of the marketing authorizations and professional advice.

Knowledge gaps and research

29. The relevant authorities should encourage public and private research to:

- improve the knowledge about the mechanisms of action, pharmacokinetics and pharmacodynamics of antimicrobial agents to optimize the dosage regimens and their efficacy;
- improve the knowledge about the mechanisms of transmission, selection, co-selection, emergence and dissemination of resistance determinants and AMR microorganisms through food;
- develop practical models for applying the concept of risk analysis to assess the public health concern precipitated by the development of resistance;
- further develop protocols to predict, during the authorization process, the impact of the proposed use of the antimicrobial agents on the rate and extent of resistance development; and
- develop and encourage good animal production and plant/crop production best management practices and alternative methods to prevent and treat infectious diseases that would reduce the need to use antimicrobial agents
- develop safe and effective alternatives to antimicrobial agents, new antimicrobial agents, rapid diagnostics, and vaccines
- determine the potential transfer to fresh produce and other plants/crops of resistant microorganisms and determinants from animal manures or other biological materials used as fertilizer or selected for during the use of production practices, and if there is subsequent transfer through food to consumers.
- improve the knowledge and the role of the environment on the transfer and persistence of antimicrobial agents.
- determine the potential transfer to animals of resistant microorganisms and determinants due to agricultural chemical use.

30. Research should be conducted, as resources permit, on antimicrobials, their metabolites, and risks of foodborne resistant microorganisms and resistance determinants in the primary production environment, and if feasible, factors affecting and the magnitude of resistance determinant transfer among microorganisms in the environment leading to foodborne AMR risk.

Collection and destruction of unused or out-of-date antimicrobial agents

31. The relevant authorities should develop effective procedures for the safe collection and destruction of unused or out-of-date antimicrobial agents.

Responsibilities of Manufacturers and Marketing Authorization Holders**Marketing authorization of antimicrobial agents**

32. It is the responsibility of the antimicrobial agent marketing authorization holders:

- to supply all the information requested by the national regulatory authority in order to establish objectively the quality, safety and efficacy of antimicrobial agents; and
- to ensure the quality of this information based on the implementation of procedures, tests and trials in compliance with the provisions of good manufacturing, good laboratory and good clinical practices.

Marketing and export of antimicrobial agents

33. Only officially licensed/authorized antimicrobial agents should be marketed, and then only through distribution systems in accordance with national legislation.

- Only antimicrobial agents meeting the quality standards of the importing country should be exported from a country in which the products were produced;
- The information necessary to evaluate the amount of antimicrobial agents marketed should be provided to the national regulatory authority.

34. Package size and the concentration and composition of antimicrobial formulations should be adapted as far as possible to the approved indications of use in order to avoid improper dosing, overuse and leftovers.

Advertising

35. It is the responsibility of the marketing authorization holders to only advertise antimicrobial agents in accordance with the provisions of paragraphs 25-27 on the Responsibilities of the Regulatory Authorities, Control of Advertising and to not advertise medically important antimicrobials to producers.

36. Advertising should only be targeted to persons permitted to prescribe or supply antimicrobial agents. Promotional campaigns involving economic or material benefits for prescribers or suppliers of antimicrobials should be discouraged.

Training

37. It is the responsibility of the marketing authorization holders to participate in the training of users of antimicrobial agents as defined in paragraph 28.

Research

38. It is the responsibility of the marketing authorization holders to support the development of research as defined in paragraph 29, as appropriate.

39. Research on the development of new antimicrobials, safe and effective alternatives to the use of antimicrobials, rapid diagnostics and vaccines should be performed.

Responsibilities of wholesale and retail distributors

40. Wholesalers and retailers distributing medically important antimicrobial agents should only do so on the prescription of a veterinarian or other suitably trained person authorized in accordance with national legislation and all products should be appropriately labelled.

41. Distributors should encourage compliance with the national guidelines on the responsible use of medically important antimicrobial agents and should keep records of all antimicrobials supplied according to the national regulations including, for example:

- date of supply
- name of prescribing veterinarian or other suitably trained and authorized person
- name of user
- name of medicinal product, formulation, strength and package size
- batch number
- quantity supplied

- expiration dates

42. Distributors should support the training of users of antimicrobial agents as defined in paragraph 28.

Responsibilities of Veterinarians⁹ and Plant/Crop Advisors or Consultants

43. Veterinarians and plant/crop advisors or consultants should identify new or recurrent disease problems and develop alternative strategies to prevent or treat infectious disease. These may include, but are not limited to, biosecurity, improved production practices, and safe and effective alternatives to antimicrobial agents, including vaccination where applicable/available.

45. Professional organizations should develop species or sector-specific guidelines on the responsible and prudent use of antimicrobial agents. National action plans may include recommendations to develop species or sector-specific guidelines.

47. Antimicrobial agents should only be used when necessary, as only as long as necessary, and in an appropriate manner:

- A prescription or order for application for medically important antimicrobial agents should indicate the dose, the dosage intervals, the duration of the administration, the withdrawal period, when appropriate, and the amount of antimicrobial agent to be delivered depending on the dosage and the characteristics of the individual or population to be treated;
- The quantity of the antimicrobial provided to the end-user should be limited only for the administration concerned. Prescriptions should also indicate the owner and the identification of the food-producing animals or plants/crops to which the antimicrobials are to be administered;
- All medically important-antimicrobial agents should be prescribed or applied and used according to label directions and the conditions stipulated in the national legislation.
- Protocols for monitoring use to allow for data collection or for quality assurance purposes should be considered.

48. For food-producing animals, the appropriate use of medically important antimicrobial agents in practice is a clinical decision that should be based on the experience and local expertise of the prescribing veterinarian, and the accurate diagnosis, based on adequate diagnostic procedures. There will be occasions when a group of food-producing animals, which may have been exposed to pathogens, may need to be treated without recourse to an accurate diagnosis and antimicrobial susceptibility testing to prevent the development and spread of clinical disease and for reasons of animal welfare.

49. To be further developed: a paragraph describing the diagnosis and treatment of plants.

50. Determination of the choice of an antimicrobial agent should be based on:

- The expected efficacy of the administration based on:
 - the experience of the veterinarian, plant/crop health professional or suitably trained and authorized person;
 - the spectrum of the antimicrobial activity towards the pathogens involved;
 - the history of the production unit particularly in regard to the antimicrobial susceptibility profiles of the pathogens involved. Whenever possible, the antimicrobial susceptibility profiles should be established before the commencement of the administration. If this is not possible, it is desirable for samples to be taken before start of the administration to allow, if necessary, for adjustment of therapy based on susceptibility testing. Should a first antimicrobial administration fail or should the disease recur, the use of a second antimicrobial agent should be based on the results of microbiological susceptibility tests;
 - the appropriate route of administration;
 - results of initial administration;
 - previous published scientific information on the treatment of the specific disease;
 - the likely course of the disease.
- The need to minimize the adverse health effect from the development of microbial resistance based on:

⁹ Under some circumstances, this may refer to a suitably trained person authorized in accordance with national legislation.

- the choice of the activity spectrum of the antimicrobial agent. Narrow-spectrum antimicrobials should be selected whenever possible/appropriate;
 - the targeting of specific microorganism;
 - known or predictable susceptibilities using antimicrobial susceptibility testing;
 - optimized dosing regimens;
 - the use of fixed combinations of antimicrobial agents (i.e. only combinations contained in authorized veterinary medicinal products) which are effective against the target pathogens;
 - the importance of the antimicrobial agents to human and veterinary medicine; and,
 - the route of administration
- If the label conditions allow for flexibility, the veterinarian or plant/crop advisor or consultant should consider a dosage regimen that is long enough to allow an effective treatment, but is short enough to limit the selection of resistance in foodborne and/or commensal microorganisms.

Off-label use

51. For food-producing animals, the off-label use of a veterinary antimicrobial agent may be permitted in appropriate circumstances and should comply with the national legislation including the appropriate and/or approved withdrawal periods to be used. It is the veterinarian's responsibility to define the conditions of use including the therapeutic regimen, the route of administration, and the duration of the administration and the withdrawal period. Off-label use of medically important antimicrobial agents should not be permitted for growth promotion.

52. Human health risk related to foodborne antimicrobial resistance should be an important factor when considering the off-label use of veterinary antimicrobial agents.

53. Medically important antimicrobials should not be used off-label for plants/crops.

Record keeping and recording

54. For food-producing animals and plants/crops, records on antimicrobial agent administration should be kept in conformity with national legislation or best management practice guidelines.

In particular, for investigation of antimicrobial resistance, veterinarians and plant/crop advisors or consultants or suitably trained persons authorized in accordance with national legislation should:

- record the antimicrobial susceptibility testing results;
- record the antimicrobial used, the dosage regimen and the duration; investigate adverse reactions to antimicrobial agents, including lack of expected efficacy, and report it, as appropriate, to the regulatory authorities (through a pharmacovigilance system, if available).

55. Veterinarians and plant/crop advisors or consultants should also periodically review farm records on the use of antimicrobial agents to ensure compliance with their directions.

Training

56. Professional organizations should participate in the development and/or delivery of training of users of antimicrobial agents as defined in paragraph 28.

Responsibilities of food producers

57. Producers are responsible for implementing health programmes on their farms to prevent and manage disease outbreaks. They should call on the assistance of veterinarians, plant/crop advisors or consultants, or other suitably trained persons authorized in accordance with national legislation. All participants involved in primary production of food have an important role to play in preventing disease and ensuring the responsible and prudent use of antimicrobial agents to minimize risk of foodborne AMR.

58. Producers have the following responsibilities:

- to use antimicrobial agents only when necessary, under the supervision of a veterinarian or plant/crop advisor or consultant when required, and not as a replacement for good management and farm hygiene practices, or other disease prevention methods;
- to implement a health plan in cooperation with the veterinarian, plant/crop advisors or consultants, or other suitably trained person authorized in accordance with national legislation that outlines measures to prevent disease;

- to use antimicrobial agents in the species, for the uses and at the doses on the approved labels and in accordance with the prescription, product label instructions or the advice of a veterinarian, plant/crop advisors or consultants or other suitably trained person authorized in accordance with national legislation familiar with the food-producing animals or the plant/crop production site;
- to isolate sick animals and dispose of dead or dying animals or plants/crops promptly under conditions approved by relevant authorities;
- to comply with the storage conditions of antimicrobial agents according to the approved product labelling;
- to address infection prevention and control measures regarding contacts between people, veterinarians, plant/crop advisor or consultants, breeders, owners, children and the food-producing animals or plants/crops treated;
- to comply with the recommended withdrawal periods or pre-harvest intervals to ensure that residue levels in or on the food do not present a foodborne AMR risk for the consumer;
- to not use out-of-date antimicrobial agents and to dispose of all unused or out-of-date antimicrobial agents in accordance with the provisions on the product labels and national legislation;
- to inform the veterinarian, plant/crop advisor or consultant, or other suitably trained person authorized in accordance with national legislation in charge of the production unit of recurrent disease problems or failures of antimicrobial applications;
- to maintain all clinical and laboratory records of microbiological diagnosis and susceptibility testing. These data should be made available to the professional in charge of the administration in order to optimize the use of antimicrobial agents.
- to keep adequate records of all antimicrobial agents used, including the following:
 - name of the antimicrobial agent/active substance and batch number;
 - name of supplier;
 - date of administration; species and number of animals;
 - identification of the production unit (animal age, numbers, weights) to which the antimicrobial agent was administered;
 - disease treated, prevented, or controlled;
 - number of animals treated;
 - daily dose and number of treatment days;
 - quantity and duration of the antimicrobial agent administered;
 - withdrawal periods;
 - result of treatment;
 - name of the prescribing veterinarian, plant/crop advisor or consultant or other suitably trained person authorized in accordance with national legislation.
- To ensure sound management of wastes and other materials to minimize dissemination of excreted antimicrobial agents, resistant microorganisms and resistance determinants into the environment where they may contaminate food;
- To address on-farm biosecurity measures and take basic infection prevention and control measures as appropriate and as provided in the *OIE terrestrial and aquatic animal health code*;
- To assist the relevant authorities in surveillance programs related to antimicrobial use and antimicrobial resistance, as appropriate.

59. The responsible and prudent use of antimicrobial agents should be supported by continuous efforts in disease prevention to minimise infection during production and decrease exposure to antimicrobial agents. Efforts should aim to improve health, thereby reducing the need for antibiotics. This can be achieved by improving hygiene, biosecurity and health management on farms, improving animal and plant/crop genetics, and implementing national or international good animal production (terrestrial and aquatic), and plant/crop production practices. Disease prevention through the use of vaccines, integrated pest management, and other measures that have been clinically proven to be safe and efficacious, such as probiotics (beneficial bacteria found in various foods), prebiotics (non-digestible foods that help probiotic bacteria grow and flourish) or

competitive exclusion products (intestinal bacterial flora that limit the colonization of some bacterial pathogens) may be considered and applied wherever appropriate and available. Disease prevention through the use of vaccines and other appropriate measures aimed at supporting animal health (such as adequate nutrition and whenever available feed additives such as prebiotics, probiotics) should be considered.

60. Concerted efforts of all stakeholders within the entire food chain are required to minimize and contain foodborne antimicrobial resistance. While such efforts mainly focus on responsible and prudent use of antimicrobial agents in primary production at the farm level, the later phase of the food chain also plays a significant role in preventing transmission and spread of resistant bacteria and resistance determinants.

Food processing industry, food retailers and consumers should take necessary action in accordance with the *Principles and guidelines for the conduct of microbiological risk management*.]

6. Practices during production, processing, storage, transport, retail and distribution of food

~~60bis. Control of technological treatments in the industry: Technological treatments of food preservation based on the application of one or more bacteriostatic factors to prevent microbial growth (sub-lethal treatments) can increase the phenotypes of resistant bacteria, contrary to conventional bactericidal treatments. Modern conservation systems cause some bacteria to be only stressed and can increase resistance through phenotypic and / or genotypic adaptations. This adaptation is sometimes associated with an increase in resistance to different antibiotics.~~

[60bis (a). Concerted efforts of all stakeholders within the entire food chain are required to minimize and contain foodborne AMR. While such efforts include focus on responsible and prudent use of antimicrobial agents in primary production at the farm level, the later phase of the food chain also plays an important role in preventing foodborne AMR.]

[60bis (b). The food processing industry and food retailers should follow the Principles and Guidelines for the Conduct of Microbiological Risk Management (CAC/GL 63-2007).]

[60bis (c). Food should be produced and handled in such a way as to minimize the presence and growth of microorganisms, which apart from having the potential to cause spoilage and foodborne illnesses can also disseminate foodborne AMR. Slaughterhouses and processing plants should follow good manufacturing practices and the Hazard Analysis and Critical Control Points (HACCP) principles. The Codex General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 4 - 2003) is a useful reference in this respect.]

~~60ter. Control of post-production contamination: Post-production contamination should not be underestimated. It can occur in the different stages of the production and consumption chain, in which food handlers have an important responsibility to avoid contamination of food with microorganisms that can be carriers of resistance genes. Food contamination usually occurs at times of increased handling, in meat during slaughter or processing. In ready-to-eat foods, the real risk is presumed cross-contamination, directly between raw and processed foods or indirectly through contaminated hands, surfaces or utensils and vectors.~~

[60ter. Food business operators should provide training on good hygienic practices, including those for minimizing cross-contamination. The WHO Five Keys to Safer Food contains useful information for food handlers to minimize the transmission of foodborne illness, including AMR infections.]

7. Consumer practices and Communication communication to consumers

61. Government, food industry and other stakeholders along the food chain should inform and educate consumers on the risks of foodborne illness, including AMR infections with resistance microorganisms and ways to minimize the risk of infection.

Some aspects to consider when communicating to consumers are:

- Identifying all the stakeholders and having a common message;
- Providing information that is clear, accessible, and targeted to a non-scientific audience;
- Considering local characteristics that affect how risks are perceived (e.g. religious belief, traditions);
- ~~Understanding the audience and testing messages to ensure they are culturally and demographically appropriate.~~

62. For more information on risk communication refer to *WHO integrated surveillance of antimicrobial resistance in foodborne bacteria* and *FAO/WHO risk communication applied to food safety handbook and the Guidelines for risk analysis of foodborne antimicrobial resistance*.

[63. The best way for consumers to ~~prevent minimize~~ foodborne illness, including infections with resistant microorganisms, AMR is through proper food handling and personal hygiene. The *WHO Five Keys to Safer*

Food Manual can be used as a tool to assist in awareness raising for ~~teach~~ consumers on how to minimize foodborne bacteria in their food.]

Proposed text Codex Secretariat:

61. Government, food industry and other stakeholders along the food chain should inform and educate consumers on the risks of foodborne illness, including infections with resistance microorganisms and ways to minimize the risk of infection. The WHO Five Keys to Safer Food Manual can be used as a tool to assist in awareness raising for consumers on how to minimize foodborne bacteria in their food.

Explanation of the change: Delete the first sentence of paragraph 63. Take the last sentence of paragraph 63 as the last sentence of paragraph 61.